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APPLICATION

of

KAROL RENAU

for

UNITED STATES LETTERS PATENT

on

FLUID HEAT EXCHANGING SYSTEM AND METHOD

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[171142.1]

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FLUID HEAT EXCHANGING SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates generally to improvements in heat exchanging systems and methods. In particular, the present invention relates to a heat exchanger system which exchanges heat with a fluid, to provide efficient heating of the fluid, for effective dispensing of the heated fluid.

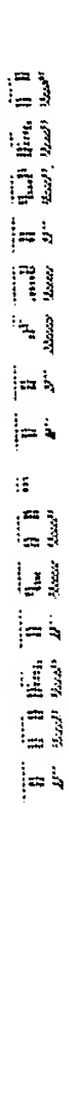
Description of the Related Art

In a system such as a fluid heating and dispensing system, such as a coffeemaker, which includes a tank for containing a fluid such as water, the fluid is heated, and the heated fluid is mixed with another component such as coffee, to enable the dispensing of a heated mixture such as heated coffee. Such a system further includes a heating element adapted to be in direct contact with the fluid in the tank, and a dump valve for enabling the dispensing of the heated mixture.

However, in heating the fluid in the tank, the fluid passes through the tank for heating thereof for only a relatively short time, making heating thereof less efficient. Moreover, the fluid temperature attained by direct contact of the heating element with the fluid is relatively unstable.

Therefore, the present invention provides improved systems and methods for enabling heat to be effectively exchanged with a fluid, so as to attain and maintain the fluid at a stable heated fluid temperature, and to enable the fluid to

be heated substantially rapidly to a stable higher fluid dispensing temperature for dispensing thereof.



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SUMMARY OF THE INVENTION

Briefly, and in general terms, the present invention provides a new and improved system and method for exchanging heat with a fluid for heating the fluid, so as to enable the efficient dispensing of heated fluid.

By way of example, and not by way of limitation, the present invention provides a new and improved system for exchanging heat with a fluid, for heating the fluid. The system includes a heat exchanger, for exchanging heat with a fluid so as to heat the fluid. The heat exchanger is adapted to store heat energy, and to enable heat energy to be exchanged with the fluid to heat the fluid. The heat exchanger has a channel therein, adapted to enable the fluid to flow thereinto and therefrom, and to enable the fluid to be retained therein. The system also includes a fluid inlet, for enabling the fluid to flow into the heat exchanger, and a fluid outlet, for enabling the heated fluid to flow out of the heat exchanger.

More particularly, for example, the heat exchanger of the present invention includes a storing element for storing heat, and a heating element for heating the storing element. The channel in the heat exchanger is generally spiral-shaped. The heating element is generally m-shaped. The heat exchanger is adapted to retain heat, such that, upon turning off the fluid inlet after dispensing heated fluid through the fluid outlet, any fluid remaining in the heat exchanger evaporates through the fluid outlet responsive thereto.

The above objects and advantages of the present invention, as well as others, are described in greater detail in the following description, when taken in conjunction with the accompanying drawings of illustrative embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a heated fluid dispensing system, with a top cover and a top plate thereof displaced from the top thereof, in accordance with an embodiment of the present invention;

FIG. 2 is a top plan view of a storing element, with a top cover thereof removed, in the practice of the invention;

FIG. 3 is a bottom view of a heating element, with a bottom cover thereof removed, pursuant to the invention; and

FIG. 4 is a side cross-sectional view of a heat exchanger, in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is directed to an improved system and method for exchanging heat with a fluid for heating the fluid in an efficient and effective manner. The improved system and method provides effective and efficient fluid heating through heat exchanging. The preferred embodiments of the improved system and method are illustrated and described herein by way of example only and not by way of limitation.

Referring to the drawings, wherein like reference numerals denote like or corresponding parts throughout the drawing figures, and particularly to FIGS. 1-4, in a preferred embodiment of a system in accordance with the invention for example, a system 10 is provided for exchanging heat with a fluid, for heating the fluid. The system 10 includes a heat exchanger 12, for exchanging heat with a fluid so as to heat the fluid, adapted to store heat energy, and to enable heat energy to be exchanged with the fluid. The heat exchanger 12 has a channel 14 therein adapted to enable the fluid to flow thereinto and therefrom, and to enable the fluid to be retained therein. The heat exchanger 12 may preferably be comprised of a metal such as for example aluminum. The channel 14 is preferably generally spiral-shaped. The system 10 also includes a sealing element 16, for sealing the heat exchanger 12, to prevent fluid leakage therefrom.

The system 10 further includes a fluid inlet 18, for enabling the fluid to flow into the heat exchanger 12. The fluid inlet 18 may comprise an inlet valve. The system 10 also includes a fluid outlet 20, for enabling the heated fluid to flow out of the heat exchanger 12. The fluid outlet 20 may comprise an outlet valve. The heat exchanger 12 is adapted to retain heat such that, upon turning off the inlet valve 16 after dispensing the fluid, any fluid remaining in the heat exchanger 12 evaporates through the outlet valve 20 responsive thereto. The system 10 also

includes a flow-controlling element 22, which for example comprises a flowmeter, for controlling the flow of fluid through the fluid inlet valve 18 into the heat exchanger 12 and through the fluid outlet valve 20 for dispensing thereof. It further includes an operations-controlling element 24, for controlling the operations of the system 10. The operations-controlling element 24 comprises a processing element for processing the temperature of the heat exchanger 12, which preferably comprises a microprocessor.

As illustrated in FIGS. 2-4, in the preferred embodiment, the heat exchanger 12 includes a storing element 26 for storing heat, and a heating element 28 for heating the storing element 26. The storing element 26 is adapted to enable fluid to be in direct contact therewith, and includes the channel 14 therein. The storing element 26 is further adapted to maintain the fluid at a heated fluid temperature, and to enable the fluid to be heated thereabove substantially rapidly to a fluid dispensing temperature. The heat exchanger 12 further includes a pair of cover plates 30 for covering the opposed sides of the storing element 26. The heating element 28 is preferably generally m-shaped, and is adapted to be connected to a power source.

Pursuant to the present invention, as shown in FIGS. 1 and 2, the system 10 further includes a sensing element 30, for sensing the temperature of the storing element 18 of the heat exchanger 12, and for controlling and stabilizing the temperature thereof. The sensing element 30 is adapted to sense and process the temperature of the storing element 26, and includes for example a microprocessor.

In the present invention, as seen in FIGS. 1 and 4, the system 10 preferably is adapted to be incorporated in a device 34 such as a coffeemaker, for dispensing a heated fluid such as heated coffee, which device 34 includes the heat exchanger 12 therein. The heat exchanger 12 is preferably located generally

in the upper portion of the dispensing device 34. The dispensing device 34 further includes an outlet 36 for dispensing the heated fluid, which outlet 36 for example may comprise a fluid spray head. The location of the heat exchanger 12 in the upper portion of the dispensing device 34 provides direct access to the fluid spray head outlet 36.

Referring to FIGS. 1-4, in the preferred method of operation of the system 10 of the invention, for example, the fluid inlet 18 is opened to enable the fluid to flow therethrough into the heat exchanger 12. The fluid flows into the channel 14 in the heat exchanger, and, with the fluid outlet 20 closed, the fluid is retained in the heat exchanger 12. Heat is exchanged in the heat exchanger 12 with the fluid, so as to heat the fluid and store heat energy. The storing element 26 is heated by the heating element 28, and heat is stored by the storing element 26, for exchanging heat in the heat exchanger 12. The fluid in the channel 14 is in direct contact with the heat exchanger 12 for exchanging heat. Upon exchanging heat with the heat exchanger 12, the fluid in the channel 14 is maintained therein in the sealed heat exchanger 12 at a heated fluid temperature, and is substantially rapidly heated thereabove to a fluid dispensing temperature as actuated prior to dispensing thereof. The fluid outlet 20 is opened to enable heated fluid to flow therethrough out of the heat exchanger 12.

As shown in FIGS. 1-2, the heated fluid is enabled to flow out of the heat exchanger 12 and through the fluid outlet 20, for dispensing thereof through the fluid spray heat 36 in the dispensing device 34. The flow-controlling element 22, such as a flowmeter for example, controls the flow of the fluid from the fluid outlet 20 for dispensing thereof. The fluid inlet 18 is turned off after dispensing of the fluid through the dispensing device 34, the retained heat in the heat exchanger 12 heats any fluid remaining in the heat exchanger 12, and the fluid remaining in the heat exchanger 12 evaporates through the fluid outlet 20 responsive thereto. The operations-controlling element 24 controls the operations of the system 10.

While the present invention has been described in connection with the specific embodiments identified herein, it will be apparent to those skilled in the art that many alternatives, modifications and variations are possible in light of the foregoing description. Accordingly, the invention is intended to embrace all such alternatives, modifications and variations as may fall within the spirit and scope of the invention as disclosed herein.